Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Flexibility for Delivery of Communications	)	
by Mobile Satellite Service Providers in the	)	IB Docket No. 01-185
2 GHz Band, the L-Band, and the 1.6/2.4	)	
GHz Bands	)	
	)	

PETITION FOR PARTIAL RECONSIDERATION AND CLARIFICATION OF INMARSAT VENTURES LTD

INMARSAT VENTURES LTD

John P. Janka
Elizabeth R. Park
LATHAM & WATKINS LLP
555 Eleventh Street, N.W.
Suite 1000
Washington, D.C. 20004
202-637-2200

Counsel for Inmarsat Ventures Ltd

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Inmarsat Ventures Ltd ("Inmarsat") hereby files this Petition for Partial Reconsideration and Clarification of the Commission's Memorandum Opinion and Order and Second Order on Reconsideration in this proceeding.[1] Inmarsat commends the Commission for revising its ATC rules in a manner that better protect existing mobile satellite service ("MSS") operations from ATC interference, while also allowing MSS operators the flexibility to add a terrestrial component to their MSS service.

I. INTRODUCTION AND SUMMARY

The new framework in the Commission's ATC rules makes it easier for MSS operators to deploy ATC through different types of technology, and using different technical parameters, than those originally proposed in this rulemaking and assumed by the Commission in its technical analyses. While Inmarsat endorses such a "technology neutral" regulatory approach, Inmarsat believes that there are a few respects in which the new ATC rules do not achieve the intended effect, or in which they fail to address an ATC interference dynamic.

[1] *Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands*, IB Docket No. 01-185, Memorandum Opinion and Order and Second Order on Reconsideration, FCC 05-30 (rel. Feb. 25, 2005) ("*Second Order on Reconsideration*").

By this Petition, Inmarsat does not seek to change the structure of the ATC rules. Instead, Inmarsat respectfully requests that the Commission make a few limited revisions to its rules regarding ATC in the L-band. First, Inmarsat requests that the Commission clarify that the ATC base station EIRP limits and power flux density limits specified in Sections 25.253(d)(1)-(7) be defined without reference to a specific 200 kHz carrier bandwidth. Second, Inmarsat requests that the Commission clarify the "trigger" for coordination between an L-Band ATC operator and another L-Band MSS operator, by specifying in Section 25.253(h) an assumed separation distance between an ATC base station and an MSS receiver. Finally, Inmarsat requests that the Commission adopt an appropriate limit to constrain the potential for ATC operations causing the "overload" of an MSS satellite receiver.

II. ATC BASE STATION EIRP AND TOTAL POWER FLUX DENSITY LIMITS SHOULD NOT SPECIFY A CARRIER BANDWIDTH

In the February 2003 *ATC Report and Order*,[2] the Commission adopted rules in Section 25.253 that were designed to limit the power emitted by L-Band ATC base stations, and thereby constrain the potential for interference into nearby MSS terminals.[3] Specifically, the Commission required an ATC applicant to demonstrate that its ATC base stations would not exceed certain per-carrier EIRP levels (with a limit of three carriers per sector), or certain aggregate power flux density levels.[4]

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[2] *Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands; Review of the Spectrum Sharing Plan Among Non-Geostationary Satellite Orbit Mobile Satellite Service Systems in the 1.6/2.4 GHz Bands*, Report and Order and Notice of Proposed Rulemaking, FCC 03-15 (rel. Feb. 10, 2003) ("*ATC Report and Order*").

[3] *See id.* at ¶¶ 148-157.

[4] *See id.* at Appendix B, § 25.253.

The rules adopted in February 2003 were based on technical analyses that assumed the use of a standard GSM protocol---either GSM/TDMA 800 or GSM 1800.[5] The February 2003 rules allow operators to employ other ATC architectures, as long as the proposed operation would produce "no more interference than operation with standard GSM protocols in compliance with the specific requirements of Section 25.253."[6] Specifically, the Commission provided:

> The preceding rules of § 25.253 are based on GSM/TDMA 800 or GSM 1800 system architecture. To the extent that an L-band MSS licensee is able to demonstrate that the use of a different system architecture would produce no greater potential interference than that produced as a result of implementing the rules of this section, an MSS licensee is permitted to apply for ATC authorization based on another system architecture.[7]

In the *Second Order on Reconsideration*, the Commission substantially changed certain technical standards for ATC in the L-Band, modified its rules, and in doing so provided ATC operators greater flexibility to implement different ATC system designs and transmission standards.[8] Therefore, the assumption that an L-Band ATC system will in fact use GSM/TDMA 800 or GSM 1800 transmission standards no longer underlies the rules. It therefore appears that the Commission amended Section 25.253 in its entirely, and in doing so deleted the note that discussed the assumption about GSM/TDMA 800 and GSM 1800 system architectures.

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[5] *See Mobile Satellite Ventures Subsidiary LLC, Application for Minor Modification of Space Station License for AMSC-1, Minor Amendment to Application for Authority to Launch and Operate a Next-Generation Replacement MSS Satellite, Application for Minor Modification for Blanket License for Authority to Operate Mobile Earth Terminals with MSAT-1*, File Nos. SAT-MOD-20031118-00333, SAT-AMD-20031118-00332, SES-MOD-20031118-01879, Order and Authorization, DA 04-3553 at ¶ 85 (rel. Nov. 8, 2004).

[6] *Id.* at ¶ 89.

[7] *ATC Report and Order,* Appendix B, § 25.253 note.

[8] *See Second Order on Reconsideration* at ¶ 1 ("We reconsider and substantially change certain technical standards for ATC in the L-band, in order to permit MSS/ATC licensees flexibility in designing and operating their ATC while at the same time preventing harmful interference from ATC to co-primary MSS licensees in the L-band."). *See also id.* at ¶ 50 ("we believe that it is important to allow MSS/ATC licensees flexibility to design their ATC in accordance with technical and market demands.").

Significantly, in the *Second Order on Reconsideration*, the Commission also reaffirmed that the potential for ATC base station interference into nearby MSS terminals is driven by the total EIRP within an ATC base station sector, and not by the number of carriers used to generate that EIRP level.[9] However, as discussed below, certain aspects of Section 25.253 were not fully modified to take into account this fact, or all of the new assumptions underlying the revised rules.

A. Base Station EIRP Limits in Section 25.253(d)(1)-(4)

A GSM/TDMA 800 or GSM 1800 transmission standard implies a 200 kHz carrier bandwidth. For this reason, Section 25.253 as originally adopted, constrained per-carrier ATC base station EIRP levels over a 200 kHz bandwidth, and the number of such 200 kHz carriers per sector. With the policy decision to facilitate other transmission standards, and the affirmation that total ATC base station EIRP per sector, not the number of carriers per sector and the EIRP per carrier, drives the potential for interference, Section 25.253 should have been correspondingly modified to remove the reference to a 200 kHz carrier bandwidth.

In its current formulation, as adopted in the *Second Order on Reconsideration*, Section 25.253(d)(1) through (4) provides for a peak ATC base station carrier EIRP of x - 10*log(number of carriers) dBW/200 kHz, per sector, for each carrier in the respective frequency band(s).[10] Since the unit specified in current Section 25.253 is dBW/200 kHz, the total EIRP per carrier calculated under this rule depends entirely on the bandwidth of the carrier. Thus, with a system that uses a carrier wider than 200 kHz, the EIRP level calculated using these formulas would be higher than for a system that uses a 200 kHz wide carrier (or less). For example, using a carrier bandwidth of 1250 kHz (as for a system with a cdma2000 architecture), the EIRP limit

[9] *Id.* at ¶ 60.

[10] *Second Order on Reconsideration*, Appendix B, § 25.253(d)(1)-(4).

calculated under Section 25.253(d) would be 8.0 dB higher than if a 200 kHz carrier were used (as for a system with a standard GSM architecture).[11]

An EIRP level 8.0 dB higher than that generated by a GSM-based ATC system would increase the level of interference into nearby MSS terminals by a factor of more than six times. Thus, Section 25.253(d)(1) through (4) as currently specified in the *Second Order on Reconsideration*, would achieve the intended objective only when the carrier bandwidth is 200 kHz, but not when a cdma2000, or another non-GSM-based architecture, is used.

In order to protect MSS ATC receivers from overload and intermodulation product interference, Section 25.253 must be revised, as the text of the of the *Second Order on Reconsideration* recognizes, to constrain the total EIRP (per sector) transmitted by an ATC base station, rather than being interpreted to allow the total base station EIRP to scale in proportion to the carrier bandwidth increase.

Therefore, Inmarsat respectfully requests that Section 25.253(d)(1)-(4) be modified by deleting the words "200 kHz," as follows:

"(1) Exceed a peak EIRP of 31.9-10*log(number of carriers) dBW~~/200 kHz~~, per sector, for each carrier in the 1525-1541.5 MHz and 1547.5-1559 MHz frequency bands;

(2) Exceed an EIRP in any direction toward the physical horizon (not to include man-made structures) of 26.9-10*log(number of carriers) dBW~~/200 kHz~~, per sector, for each carrier in the 1525-1541.5 MHz and 1547.5-1559 MHz frequency bands;

(3) Exceed a peak EIRP of 23.9-10*log(number of carriers) dBW~~/200 kHz~~, per sector, for each carrier in the 1541.5-1547.5 MHz frequency band;

(4) Exceed an EIRP toward the physical horizon (not to include man-made structures) of 18.9-10*log(number of carriers) dBW~~/200 kHz~~, per sector, for each carrier in the 1541.5-1547.5 MHz frequency band;"

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[11] The formula using a 1250 kHz carrier bandwidth yields a result of "X-10*log(number of carriers)+10*log(1250/200)," as compared to the formula using a carrier bandwidth of 200 kHz, which yields a result of "X-10*log(number of carriers)."

B. Power Flux Density Limits in Section 25.253(d)(5)-(7)

Sections 25.253(d)(5)-(7) should be modified to delete the reference to a 200 kHz carrier bandwidth for the same types of reasons specified in Section II.A above. These three subsections, which constrain ATC base station power flux density limits are expressed in units of "dBW/m^2/200 kHz."[12] As discussed above, the Commission originally established these power flux density limits based on the 200 kHz bandwidth used in a GSM system architecture.

As with the Sections 25.253(d)(1)-(4), Sections 25.253(d)(5)-(7) are intended to protect Inmarsat receivers from overload and intermodulation product interference. To achieve this objective, these rules should constrain the total power flux density (per sector) created by the ATC base station, without regard to the bandwidth of the individual carriers used at the base station.

Unfortunately, the current wording of these three subsections does not achieve the objective because of the units used in the rule (i.e., dBW/m^2/200 kHz). The rules, as worded, would achieve the intended objective only when the carrier bandwidth is 200 kHz. If the carrier bandwidth is greater than 200 kHz, the rule would permit an increase in base station power flux density in proportion to the carrier bandwidth increase, thus correspondingly increasing the potential interference into an MSS system.

Clearly, the Commission did not intend to allow the choice of an ATC architecture (cdma2000 versus standard GSM) to increase the potential for interference into nearby MSS terminals. Therefore, Inmarsat respectively requests that Section 25.253(d)(5)-(7) be modified as follows by deleting the reference to the assumed carrier bandwidth:

"(5) Exceed a total power flux density level of -56.8 dBW/m^2~~/200 kHz~~ at the edge of all airport runways and aircraft stand areas, including takeoff and landing paths from all

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[12] *Second Order on Reconsideration*, Appendix B, § 25.253(d)(5)-(7).

carriers operating in the 1525-1559 MHz frequency bands. The total power flux density here is the sum of all power flux density values associated with all carriers in a sector in the 1525-1559 MHz frequency band, expressed in dB(Watts/m^2~~/200 kHz~~). Free-space loss must be assumed if this requirement is demonstrated via calculation;

(6) Exceed a total power flux density level of -56.6 dBW/ m^2~~/200 kHz~~ at the water's edge of any navigable waterway from all carriers operating in the 1525-1541.5 MHz and 1547.5-1559 MHz frequency bands. The total power flux density here is the sum of all power flux density values associated with all carriers in a sector in the 1525-1541.5 MHz and 1547.5-1559 MHz frequency bands, expressed in dB(Watts/m^2~~/200 kHz~~). Free-space loss must be assumed if this requirement is demonstrated via calculation;

(7) Exceed a total power flux density level of -64.6 dBW/ m^2~~/200 kHz~~ at the water's edge of any navigable waterway from all carriers operating in the 1541.5-1547.5 MHz frequency band. The total power flux density here is the sum of all power flux density values associated with all carriers in a sector in the 1541.5-1547.5 MHz frequency band, expressed in dB(Watts/m^2~~/200 kHz~~). Free-space loss must be assumed if this requirement is demonstrated via calculation;"

III. SECTION 25.253(H) SHOULD SPECIFY ALL RELEVANT PARAMETERS NEEDED TO DETERMINE WHEN COORDINATION IS REQUIRED

In the *Second Order on Reconsideration*, the Commission recognized the need to protect MSS receivers from intermodulation effects generated by nearby ATC base stations. Specifically, the Commission adopted a new rule provision defining a procedure to be followed to reduce the chance of harmful intermodulation products that overlap a frequency band used by the MSS operator's terminals in the proximity of the ATC base station.[13] Section 25.253(h) establishes a threshold interference signal level that triggers an obligation by the MSS ATC system operator to notify and coordinate with the affected MSS operator,[14] and, as appropriate, to modify the base station carrier frequencies or reduce the maximum base station EIRP on the frequencies contributing to the intermodulation products.

[13] *Second Order on Reconsideration* at ¶ 58.

[14] *Id.* at Appendix B, § 25.253(h).

Section 25.253(h) sets forth three key assumptions to be used in calculating when the sum of the calculated signal levels at the antenna output received by an MSS receiver would equal or exceed -70 dBm, and when notification and coordination therefore are required:

- the MSS receiver has an antenna with 0 dBi gain;
- free-space propagation exists between the base station antennas and the MSS terminals; and
- actual signal polarizations for the ATC signals and the MSS system apply.

Although it specifies the other relevant parameters---threshold receiver sensitivity to intermodulation effects, receiver antenna gain, polarization, and certain propagation effects---the rule does not mention a reference distance between the ATC base station and the MSS receiver. It is axiomatic that the distance between a transmitter and a receiver fundamentally impacts the calculation of the signal level received at the receiver. Thus, in order to clearly establish when an ATC operator is obligated to coordinate with an MSS operator, it is essential that Section 25.253(h) be revised to indicate the separation distance between an ATC base station and an MSS receiver that is to be assumed in the calculation of the impact of ATC intermodulation products.

In the February 2003 *ATC Report and Order*, the Commission assumed that an MSS terminal could be located within 100 meters of an ATC base station in an urban area.[15] Inmarsat therefore proposes adopting a reference distance of 100 meters in Section 25.253(h) as the assumed MSS terminal distance from an ATC base station. Assuming a 100 meter separation not only is consistent with prior Commission assumptions about the operation of MSS terminals, but also takes into account the fact that new mobile satellite technologies are evolving that make MSS service more accessible than ever to users in urban areas. Significantly, because Section

[15] *ATC Report and Order* at ¶¶ 151-152.

25.253(h) establishes a coordination obligation, but does not impose an absolute constraint on the operation of an ATC base station, use of a 100 meter separation distance should not unduly constrain the deployment of ATC.

Thus, Inmarsat respectfully requests that Section 25.253(h) be modified as follows:

(h) When implementing multiple base stations and/or base stations using multiple carriers, where any third-order intermodulation product of these base stations falls on an L-band MSS band coordinated for use by another MSS operator with rights to the coordinated band, the MSS ATC licensee must notify the MSS operator. The MSS operator may request coordination to modify the base station carrier frequencies, or to reduce the maximum base station EIRP on the frequencies contributing to the third-order intermodulation products. The threshold for this notification and coordination is when the sum of the calculated signal levels received by an MSS receiver exceeds -70 dBm. The MSS receiver used in these calculations can be assumed to have an antenna with 0 dBi gain, and to be located at a distance of 100 meters from the ATC base station antenna. Free-space propagation between the base station antennas and the MSS terminals can be assumed and actual signal polarizations for the ATC signals and the MSS system may be used.

IV. THE COMMISSION SHOULD ADOPT A LIMIT TO CONSTRAIN THE POTENTIAL FOR ATC OVERLOAD OF AN MSS SATELLITE RECEIVER

In the *ATC Report and Order*, the Commission limited the number of simultaneously transmitting ATC mobile terminals to 90,000 in order to constrain the potential for adjacent channel interference into MSS spacecraft.[16] Correspondingly, this limit also constrained the potential for a related interference problem into an MSS satellite---overload of the satellite receiver. In its February 3, 2005 *ex-parte* submission, Inmarsat explained how a large number of L-band ATC mobile terminals operating in the USA could cause catastrophic overload of the analog to digital converters in the Inmarsat-4 satellite.[17] This interference phenomenon would arise from the aggregate transmissions of all ATC mobile terminals

[16] *See ATC Report and Order* at ¶ 188.

[17] *See* Letter from John P. Janka to Marlene H. Dortch, Secretary, *Ex Parte Presentation, IB Docket No. 01-185, File No. SAT-MOD-20031118-00333, File No. SAT-AMD-2003118-00332, File No. SES-MOD-20031118-01879,* ATC and Overloading of the I4 Satellites (filed Feb. 3, 2005).

operating within the overall receive band of the Inmarsat-4 satellite. Even aggregated ATC mobile terminal signals operating in parts of the L-band spectrum not used by Inmarsat for its service in North America would contribute to degraded performance in the receive band of the satellite.

The design of the Inmarsat-4 satellite is able to accommodate the potential overload effects generated by the 90,000 maximum simultaneously operating L-Band ATC terminals specified in the February 2003 *ATC Report and Order*, assuming those terminals were operating in a manner consistent with the "baseline" ATC architecture specified in that *Order.* In the *Second Order on Reconsideration*, the Commission moved from a numerical limit on the number of ATC base stations and simultaneously operating ATC mobile terminals, to a limit based on the potential increase in system noise that would be generated by combined MSS/ATC operations into another MSS system, thereby increasing the flexibility to use different ATC technologies and architectures.[18] That new paradigm no longer constrains the potential for overload of the MSS satellite receiver from ATC mobile terminals.

In the absence of an appropriate limit, the number of ATC mobile terminal transmissions could increase in an uncontrolled manner and reach a level that would cause serious overload problems for the Inmarsat-4 satellite receiver. Inmarsat became aware of the Commission's plans to change its paradigm for constraining ATC interference shortly before the release of the *Second Order on Reconsideration*, and Inmarsat submitted its February 3, 2005 *ex parte* analysis of this issue promptly after becoming aware of the new problem. Unfortunately, the Commission does not appear to have taken that analysis into account in issuing the *Second Order on Reconsideration.*

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[18] *Second Order on Reconsideration* at ¶ 49.

For the reasons set forth in its February 3, 2005 *ex parte* submission, Inmarsat urges the Commission to adopt an appropriate limit on the aggregate emissions of all transmitting L-Band ATC mobile terminals operated under all L-Band ATC systems, in order to constrain the potential for ATC transmissions causing overload of an MSS satellite receiver. Moreover, as originally required in the February 2003 *ATC Report and Order*,[19] the Commission should require monitoring and reporting to the Commission of the peak traffic on each licensed L-Band ATC system, so that both the Commission and potentially affected L-Band satellite operators can be apprised of the extent of ATC deployment and monitor the potential overload situation. Furthermore, ATC operators should be free to coordinate ATC operations is excess of the limit with affected L-Band satellite operators. Doing so would provide a reasonable level of protection for L-Band satellite operators, while providing the flexibility, assuming successful advance coordination can be achieved, to exceed the specified limit.

[19] *See ATC Report and Order* at ¶ 188.

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For the foregoing reasons, Inmarsat respectfully requests that the Commission clarify and reconsider its *Second Order on Reconsideration* in this proceeding in the limited manner and to the limited extent specified above.

Respectfully submitted,

INMARSAT VENTURES LTD

By: */s/ John P. Janka*

John P. Janka
Elizabeth R. Park
LATHAM & WATKINS LLP
555 Eleventh Street, N.W.
Suite 1000
Washington, D.C. 20004
202-637-2200

Counsel for Inmarsat Ventures Ltd

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ENGINEERING INFORMATION CERTIFICATION

I hereby certify that I am the technically qualified person responsible for reviewing the engineering information contained in the foregoing submission, that I am familiar with Part 25 of the Commission's rules, that I have either prepared or reviewed the engineering information submitted in this pleading, and that it is complete and accurate to the best of my knowledge and belief.

Richard J. Barnett, PhD, BSc

Telecomm Strategies, Inc.
6404 Highland Drive
Chevy Chase, Maryland 20815
(301) 656-8969

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